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Synthesis of new p-tert-butylcalix[4]arene-based polyammonium triazolyl amphiphiles and their binding with nucleoside phosphates

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Abstract

© 2018 Burilov et al. The synthesis of new calix[4]arenes adopting a cone stereoisomeric form bearing two or four azide fragments on the upper rim and water-soluble triazolyl amphiphilic receptors with two or four polyammonium headgroups via copper-catalyzed azide–alkyne cycloaddition reaction has been performed for the first time. It was found that the synthesized macrocycles form stable aggregates with hydrodynamic diameters between 150–200 nm and electrokinetic potentials about +40 to +60 mV in water solutions. Critical aggregation concentration (CAC) values were measured using a micelle method with pyrene and eosin Y as dye probes. The CAC values of tetraalkyl-substituted macrocycles 12a,b (5 μM for both) are significantly lower than those for dialkyl-substituted macrocycles 10a,b (790 and 160 μM, respectively). Premicellar aggregates of macrocycles 10a,b and 12a,b with the dye eosin Y were used for nucleotides sensing through a dye replacement procedure. It is unusual that disubstituted macrocycles 10a,b bind more effectively a less charged adenosine 5'-diphosphate (ADP) than adenosine 5'-triphosphate (ATP). A simple colorimetric method based on polydiacetylene vesicles decorated with 10b was elaborated for the naked-eye detection of ADP with a detection limit of 0.5 mM.

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Keywords

ADP, Amphiphile, ATP, Calix[4]arene, CuAAC, Eosin Y probe, Molecular recognition, Polydiacetylene, Self-assembly, Triazole

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